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RECENTLY PUBLISHED RESEARCH OF THE LENINGRAD PHYSICOTECHNICAL INSTITUTE, ACADEMY OF SCIENCES USSR

"Relations Between the Various Theories of the Viscosity of Liquids," Ya. I. Grenkel Leningrad Physicotech Inst, Acad Sci USSR

"Iz Ak Nauk SSSR, Otdel Tekh Nauk, Mashinovedeniya, Soveshchanie Vyazkosti Zhidkostei i Kolloid Rastvorov" Vol 2, 1944, pp 24-9

A comparison of the gaskinetic and the diffusion-activation theories. The approach through scattering of superposed elastic waves is shown to be applicable only to the case of extremely small viscosities.

"Solutions of Polymers With Linear Structure: I. Influence of Volumetric Thermal Expansion on the Viscosity of Solutions," E. V. Kuvshinskiy, Leningrad Physicotech Inst, Acad Sci USSR

"Zhur Tekh Fiziki" Vol 14, 1944, pp 749-56

When conclusions on the length and rigidity of polymer molecules are derived from the temperature coefficient of the intrinsic viscosity, this coefficient should be calculated for a constant volume concentration (molecules per l at the test temperature). The coefficient calculated for a constant weight concentration c (molecules per kilogram) differs increasingly from the correct one, the more the relative viscosity η_r varies with concentration.

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A convenient equation for c and η_r is $\log \eta_r = ac + bc^2$.

"Nuclear Isomers With Long Lifetimes," L. I. Rusinov, Ya. M. Igel'nitskiy, Leningrad Physicotech Inst, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 47, 1945, pp 338-41

The lifetime of nuclear isomers with respect to radiation transitions can be estimated by use of a number of formulas derived on various assumptions concerning the nucleus. This computed lifetime should then be decreased, because of the possibility of discharge of the isomers by internal electron conversion, which must be further calculated by special formulas. L. D. Landau's formula for estimation of the lifetime of nuclear isomers was derived by assuming that the nucleus radiates as a "one-particle" model. It differs from the other formulas in that allowance is made for the influence of internal electron conversion. The effective radius of the nucleus is taken as 5×10^{-13} centimeter. The lifetimes in years of the investigated elements are: Cd48(all of the isotopes)$>4 \times 10^{15}$, $In^{113,115}_{49} > 3 \times 10^{15}$, $Au^{197}_{79} > 7 \times 10^{14}$, $Bi^{209}_{83} > 1 \times 10^{15}$.

"Molecular Mechanism of the Solidification of Polymers," S. N. Zhurkov, Leningrad Physicotech Inst, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 47, 1945, pp 493-6

The molecular mechanism of the solidification of polymers that do not undergo crystallization upon solidification is similar to the formation of an amorphous glassy mass by supercooled liquids. On the basis of a previous investigation of the volume sorption of volatile solvent vapors, it is concluded that the fall in the temperature of solidification is proportional to the number of sorbed molecules irrespective of their chemical nature. This indicates direct dependence on the concentration in the polymer of certain active groups that are blocked during sorption. The formation of molecular bonds between active sites (nodes) is the basis of the mechanism of the transition from a rubberlike to the solid state. Mathematical treatment for determining energy of bond formation resulting in the solid state is given. The binding energy of a node calculated for polymethyl methacrylate, nitrile rubber, polyisobutylene, and divinyl rubber amounts to 25 - 30% of the total binding energy obtained from the heats of vaporization.

"Phenomenon of the Lower Limit in the Low-Temperature Polymerization of Hydrocarbons," S. E. Bresler, Leningrad Physicotech Inst, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 47, 1945, pp 428-9

Bivinyl in which up to 0.3% BF_3 is dissolved practically does not polymerize at all until the temperature is raised to -76°. Then an auto-accelerating reaction suddenly sets in, attaining explosivelike proportions. The same holds for isoprene except that the critical temperature is -68°. The auto-acceleration reaction is not thermal in nature. If the polymerization is effected in solutions of low-boiling hydrocarbon solvents, isothermal conditions are maintained in the reaction mixture.

"Theory of Crystal Coloration by X-Rays," G. F. Drukarev, Leningrad Physicotech Inst, Acad Sci USSR

"CR Acad Sci URSS" Vol 52, 1946, pp 215-17

Some crystals absorb light in the visible range on illumination by x-rays. Sufficiently hard x-rays, as well as thermal vibrations, can form the "holes" required for the trapping of the electrons freed by the x-rays. The equation $\nu = MW/mh$ is derived for the relation between ν, the frequency of the hard x-rays, and W, the activation energy necessary to transfer a negative ion from the lattice point it occupies to an interstitial position; M = the mass of the ion and m = the mass of the electron.

"Born's Crystal Lattice Theory and Light Scattering," E. Gross, Leningrad Physicotech Inst, Acad Sci USSR

"CR Acad Sci URSS" Vol 54, 1946, pp 781-2

The intensity peaks of the Raman spectrum of NaCl are shown to correspond to the elastic vibration spectrum computed by Kellermann (CA 34, 6868[3]) as confirmation of Born's theory.

"Surface Ionization of Thin Layers of Calcium and Magnesium Oxides," L. N. Dobretsov, S. V. Starodubtsev, Ya. I. Tinokhina, Leningrad Physicotech Inst, Acad Sci USSR

"CR Acad Sci URSS" Vol 55, 1947, pp 303-6

The ionization of calcium and magnesium on W filaments was found to be many times greater than it should be according to the equation of Langmuir-Saha. This was attributed to coatings of the alkaline earth oxides. Experiments showed that surface ionization is substantially different on oxide films than it is on pure metals.

"Electric Method of Seperation of Nuclear Isomers," L. I. Rusinov, A. S. Karamian, Leningrad Physicotech Inst, Acad Sci USSR

"CR Acad Sci URSS" Vol 55, 1947, pp 599-600

Radioactive Br samples a fraction of a μ thick were prepared directly from EtBr by electrolysis. EtBr (50 cc) was first subjected to intense radiation by slow neutrons. The electrolysis was carried out by using a highly polished Ag disc (diam ~ 15 mm) as the anode and a semicircular Pt plate (10 mm wide) placed along the inner wall of a porcelain vessel as the cathode. The anode was rotated at a rate of approximately 80 rpm, with a current of approximately 0.004 milliamp. The extraction continued for about 30 minutes. The intensity of electron radiation from Br was measured with a cylindrical ionization chamber. Two hours after irradiation, an analysis of the experimental curves showed an activity with a half life of about 18 minutes, in addition to 4.2- and 34-hour periods. The 18-minute period was also observed when electrolysis was carried out 4 hours after neutron irradiation. The 18-minute β - activity is attributed to the disintegration of radioactive Br^{80} produced by the discharge of metastable Br^{80} nuclei. When EtBr activated by neutrons is subjected to electrolysis the nuclear isomers are separated, and their decay takes place in accord with the schema of successive disintegration.

"The Principle of Enzymic Synthesis Under Pressure," S. E. Bresler, Leningrad Physicotech Inst, Acad Sci USSR

"CR Acad Sci URSS" Vol 55, 1947, pp 141-3

Gelatin (2.8 g in 60 ml H_2O) and 8.6 ml borate buffer at pH 7.8 were treated with 0.1 g crystal trypsin in 10 ml H_2O at 34°. After 2 hours amino N increased from 0.024 mg/ml to 0.112 mg/ml (Van Slyke); relative viscosity decreased. The mixture was then maintained at 6,000 atm for 8 hours at 37°, the product possessed the initial amino N content and relative viscosity. No corresponding change was observed in the presence of heat-denatured enzyme. Similar results were noted with tryptic action on serum globulin, and amylase action on starch.

"The Amorphous State: Dependence of the Electrical Conductivity of Undercooled Liquids on Pressure, Volume, and Temperature," P. P. Kobeko, N. I. Shishkin, Leningrad Physicotech Inst, Acad Sci USSR

"Zhur Tekh Fiziki" Vol 17, 1947, pp 27-36

In a cylindrical bomb 13 cm in diameter, 16 cm long, wall thickness 5.4 cm, permitting pressures p up to 6,000 atm, equipped with a cylindrical inner electrode and protective ring to permit resistivity measurements up to 10^{16} ohm cm, determinations were made on a fused 1:1(by wt) mixture of phenolphthalein and salol. Complete experimental data available.

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There is a deep difference between the structural changes brought about by compression and by thermal contraction and a challenge to current theories linking properties of liquids essentially with changes of density.

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